

The opinion in support of the decision being entered today was **not** written for publication and is **not** binding precedent of the Board.

Paper No. 11

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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Ex parte WILLIAM J. DAUKSHER and DOUGLAS J. RESNICK

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Appeal No. 1998-2329  
Application No. 08/740,402

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ON BRIEF

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Before PAK, OWENS, and WALTZ, Administrative Patent Judges.  
WALTZ, Administrative Patent Judge.

**DECISION ON APPEAL**

This is a decision on an appeal under 35 U.S.C. § 134 from the examiner's final rejection of claims 1 through 9 and 19. Claims 10 through 18 are the only other claims pending in this application but remain withdrawn from consideration by the examiner as being directed to a non-elected invention (Final Rejection dated Sep. 3, 1997, Paper No. 4, page 2).

According to appellants, the invention is directed to a method of forming a low stress, hard mask for use in refractory

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radiation mask fabrication where depositing an oxynitride as a hard mask layer has been found to produce stresses low enough to come within the range specified in the claims (Brief, page 4). A copy of illustrative claim 1 is attached as an Appendix to this decision.

The examiner has relied upon the following references as evidence of obviousness:

|                               |           |              |
|-------------------------------|-----------|--------------|
| Tabuchi                       | 4,440,841 | Apr. 3, 1984 |
| Bohlen et al. (Bohlen)        | 4,448,865 | May 15, 1984 |
| Leedy<br>(filed June 7, 1995) | 5,580,687 | Dec. 3, 1996 |

Claims 1 through 5 stand rejected under 35 U.S.C. § 112, first paragraph, as failing to meet the written description requirement (Answer, page 4). Claims 1-9 and 19 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Bohlen or Tabuchi in view of Leedy (Answer, pages 5-13).<sup>1</sup> We reverse all of the examiner's rejections for reasons stated below.

#### OPINION

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<sup>1</sup> For judicial economy, we have combined the examiner's rejections since they involve the same references and issues. In fact, the examiner had only made two rejections under section 103(a) in the Final Rejection (Paper No. , pages 3 and 5) but expanded these rejections into six rejections in the Answer.

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A. *The Rejection under 35 U.S.C. § 112, ¶1*

The examiner finds that the claims contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the art that the inventors had possession of the subject matter in question, namely the average stress and range of stresses as recited in claim 1 on appeal (Answer, page 4). The examiner recognizes that the specific stress values claimed are exemplified for a specific case found on page 10 of the specification but states that there is nothing in the specification to suggest that this specific value would apply to all cases (*id.*).

Appellants argue that the example on page 10, lines 12-28, of the specification essentially defines the "reduced stress" limitation of the original claims and thus claim 1 on appeal has been limited to a hard mask layer similar to that described on page 10 of the specification (Brief, pages 7-8).

The initial burden of proof is on the examiner to establish that the specification fails to reasonably convey to one of ordinary skill in the art that appellants had possession of the subject matter in question. See *Vas-Cath Inc. v. Mahurkar*, 935

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F.2d 1555, 1563, 19 USPQ2d 1111, 1117 (Fed. Cir. 1991). The examiner agrees with appellants that the specific stress values recited in claim 1 on appeal are described on page 10, lines 25-28, of the specification (Answer, page 4; Brief, page 8).

Accordingly, by inserting these stress values into claim 1 on appeal, appellants have merely limited the claimed method to hard mask material systems made under any conditions that produce these stress values. The examiner has not met the initial burden of proof by presenting any convincing evidence or reasoning as to why the specification does not reasonably convey to one of ordinary skill in the art that appellants were in possession of these stress values for hard mask layers.

Accordingly, we cannot sustain the examiner's rejection of claims 1-5 under 35 U.S.C. § 112, first paragraph.

*B. The Rejections under 35 U.S.C. § 103*

The examiner finds that Bohlen does not teach the use of an oxynitride material that reduces compressive and tensile stress in the mask layer but merely discloses that the hard mask should be made from an oxide (Answer, page 6; specifically, Bohlen teaches silicon dioxide as a hard mask material, as found by the examiner on page 5 of the Answer). Similarly, the examiner

finds that Tabuchi does not disclose the stress effects of the oxide and nitride or depositing the oxynitride by PECVD processing (Answer, page 10).<sup>2</sup>

To remedy this deficiency of either Bohlen or Tabuchi, the examiner applies Leedy for the teaching that a hard mask made of silicon dioxide and silicon nitride forms an oxynitride which together lower tensile stress levels (Answer, pages 5-6). The examiner states that "[t]he purpose of the Leedy reference is to demonstrate the combination of silicon nitride and silicon dioxide to make an oxynitride and that oxynitrides provide reduced stress." Answer, page 14. However, the examiner has not provided any factual basis in Leedy to support the above noted findings. Leedy discloses that silicon oxide and silicon nitride dielectric films are used as free standing membranes (col. 6, ll. 27-34) and that deposition of these low stress dielectric films on either side of the semiconductor layer will

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<sup>2</sup> The examiner finds that Tabuchi discloses a masking film comprising at least one layer from various selected metals, metal oxides, and metal nitrides (see col. 2, ll. 29-33; col. 3, ll. 38-42). However, the examiner presents no convincing evidence or reasoning that two or more of these materials in a film would form an oxynitride mask film with stress values within the ranges recited in claim 1 on appeal.

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offset most compressive effects of oxide formation (col. 8, ll. 44-47). The two recipes taught by Leedy are for dielectric membranes of silicon dioxide or silicon nitride (col. 11, ll. 14-16, emphasis added). Leedy further teaches that these free standing membranes may be used as lithographic masks, preferably made from oxide and nitride low stress dielectrics (col. 38, ll. 4-14). The examiner has not presented any factual basis for the findings that Leedy demonstrates the combination of silicon nitride and silicon oxide as hard mask materials, nor that even such combination would produce an oxynitride with stresses within the ranges recited in claim 1 on appeal (see the Brief, page 10).

Additionally, we note that both Bohlen and Leedy teach reduction of mechanical tensions in the mask system by depositing layers on both sides of the silicon frame substrate to produce compensatory tensions (see Bohlen, col. 4, ll. 4-15; col. 6, ll. 24-31; col. 10, ll. 61-66; and col. 12, ll. 42-44; see Leedy, col. 8, ll. 44-47). Accordingly, the examiner has failed to present any reason, suggestion or motivation for combining these references as proposed, i.e., why would one of ordinary skill in the art substitute the hard mask material of

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Leedy for the mask material of Bohlen if the stresses were already offset by the deposited layers. See *In re Dembiczak*, 175 F.3d 994, 999, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999).

For the foregoing reasons, we determine that the examiner has not presented a sufficient factual basis to support a *prima facie* case of obviousness. Accordingly, the examiner's rejections under 35 U.S.C. § 103 are reversed.

*C. Summary*

The rejection of claims 1-5 under 35 U.S.C. § 112, first paragraph, is reversed. The rejection of claims 1-9 and 19 under 35 U.S.C. § 103 over Bohlen in view of Leedy is reversed. The rejection of claims 1-9 and 19 under 35 U.S.C. § 103 over Tabuchi in view of Leedy is reversed.

The decision of the examiner is reversed.

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**REVERSED**

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| CHUNG K. PAK                | ) |                 |
| Administrative Patent Judge | ) |                 |
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|                             | ) | BOARD OF PATENT |
| TERRY J. OWENS              | ) | APPEALS         |
| Administrative Patent Judge | ) | AND             |
|                             | ) | INTERFERENCES   |
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| THOMAS A. WALTZ             | ) |                 |
| Administrative Patent Judge | ) |                 |

TAW/jrg

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1. A method of forming a hard mask for use in the formation of a refractory radiation mask comprising the steps of:

providing a membrane structure including a step of forming a radiation absorbing layer to be patterned as a portion of the membrane structure;

forming a hard mask layer on a surface of the radiation absorbing layer of the membrane structure, the hard mask layer including a material system creating an average stress in the membrane structure of less than  $1E08$  dynes/cm<sup>2</sup> and a range of stresses from +  $1.5E08$  dynes/cm<sup>2</sup> to - $1.5E08$  dynes/cm<sup>2</sup> and therefore reduced distortion of the membrane structure; and

patterning the hard mask layer.

